

NORCHIP *and* NORCHIEF

Two New NDSU Potato Varieties

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Last spring North Dakota State University released two new potato varieties, Norchip and Norchief. Norchip, a white skinned variety, was tested under the pedigree number ND5899-1 and Norchief, a red skinned variety was formerly known as ND5778-2R.

The introduction of these two varieties makes a total of eight varieties released by NDSU since 1957. The most popular varieties released in the past have been Norland, Norgold Russet and Viking. Norland and Norgold Russet have been most popular as both seed and table stock varieties while Viking has been grown mainly as a table stock variety.

Norchip — Use and Importance

Norchip is a medium early maturing variety with excellent chip quality. The chipping quality of this new variety is comparable or slightly better than the commonly grown chipping variety Kennebec.

The introduction of a high quality chip variety is of a great economical importance to both the producer and food manufacturer. In the past few years production of this snack food and its use in the American diet has been phenomenal. The annual U. S. growth rate of potato chips has been from 8 to 12 per cent per year, and with anticipated

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Figure 1. Qualities of latest NDSU potato releases are studied by Dr. Johansen. Udo Keller, a technician is at right.

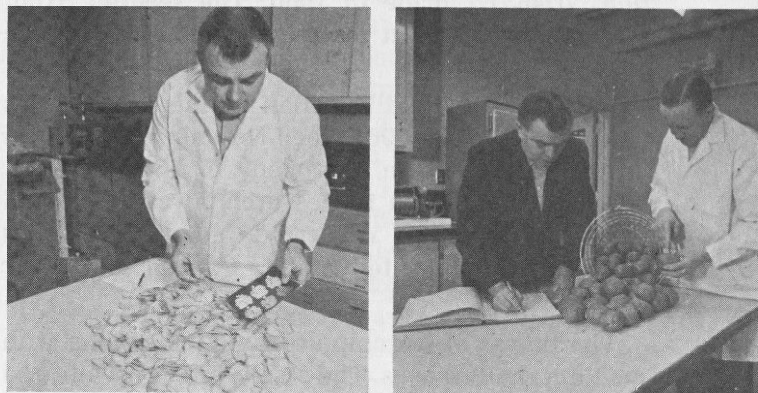


Figure 1. Qualities of latest NDSU potato releases are studied by Dr. Johansen. Udo Keller, a technician is at right.

sales of 850 million dollars for 1968, the future of the industry appears bright. This growth, along with the release of Norchip, should strengthen the market for North Dakota and Red River Valley potatoes.

Chipping tests by the processing laboratory at East Grand Forks, commercial chip companies and the Department of Horticulture show that the chip color of Norchip is equal to or better than several common chipping varieties (Table 1). The light brown highly acceptable color and the per cent recoverable product of this new variety is considered to be excellent.

Other processing tests with Norchip included cooperative studies with Campbell Soup Company. These tests were of great significance as certain companies, in particular those which process soups and frozen food products, now use large amounts of Irish potatoes as a raw product and a desirable variety is essential. Preliminary tests indicated that Norchip was satisfactory for several processed food products.

Table 1. Chip Quality Tests of Norchip and 4 Standard Chipping Varieties Grown at Grand Forks and Park River, North Dakota.

	Grand Forks					Park River				
	Chip Color ¹					Chip Color ¹				
	40°F.		70°F. (after recond.)			40°F.		70°F. (after recond.)		
	1965	1966	1965	1966	yield ²	1965	1966	1965	1966	yield ²
Norchip	6.3	8.0	4.0	3.0	34.6	10.0	10.5	4.0	4.0	34.5
Kennebec	9.3	9.0	5.5	6.5	33.4	9.0	10.5	4.0	4.0	33.9
Irish Cobbler	10.0	8.5	9.0	3.5	34.6	11.0	10.0	8.5	4.5	34.6
La Chipper	8.5	10.5	8.0	6.5	32.9	9.5	11.0	7.0	6.5	33.8
Snowflake	10.5	9.5	8.0	7.0	33.6	11.0	9.5	6.5	5.5	34.0

1. Chip color determined by standard chip chart, (1 light, 11 dark). Samples chipped out of 40° storage and after reconditioning for 5 weeks at 70°F.

2. Per cent chip yield.

Breeding and Characteristics of Norchip

Norchip resulted from a cross between a Canadian selection M5009-2 and a North Dakota selection ND4631-1 made in 1960. The seedling from the cross was grown in the greenhouse the same year.

The initial field selection of this variety was made in the fall of 1961 when Norchip was selected as the only clone in a progeny of 136 seedlings. After its selection in 1961, Norchip was grown and tested in several replicated adaptation trials throughout the United States, Canada and other countries.

The tubers of Norchip are round to oblong with medium shallow eyes. The skin is creamy white and smooth. Tuber set per hill is quite numerous, resulting in many uniform shaped tubers of medium size.

The yield of Norchip is quite comparable to Kennebec but higher than Irish Cobbler and La-Chipper (Table 2). Early seasonal yield of this new variety is higher than late maturing varieties like Kennebec.

Norchip is comparable or slightly higher in total solids than Irish Cobbler and generally much higher than Kennebec. Three year tests in replicated trials at two locations showed Norchip to average 22.5 per cent total solids (Table 3).

Norchip was grown and tested in the North Central Regional trials during 1965-67. During the three year tests Norchip only ranked 5th or 6th in the overall merit rating tests. However, this variety did rank in the top five in Missouri, Kansas, Indiana, North Dakota, Ohio, Wisconsin and Iowa.

Norchip has moderate resistance to common and russet scab. It is susceptible to late blight and most common potato viruses.

Norchief — Use and Importance

For many years, North Dakota, and in particular the Red River Valley, has been one of the largest producers of red skinned potato varieties. Of the total production in this area approximately 30 per cent is grown for washed table stock, with the majority of the potatoes going to markets in Kansas City, Chicago and other Central and Southern cities. This production of fresh washed potatoes could naturally change with increased processing. However, it is anticipated that there will always be need for varieties adapted for the fresh wash market. Norchief with its good type, bright red skin color and quality should help strengthen this market.

Breeding and Characteristic of Norchief

Norchief resulted from a cross between Redkote and ND4468-1. Redkote also was one of the parents of the Norland variety released by NDSU in 1957. The cross resulting in Norchief was made in the greenhouse in 1960 and the seedling from the cross was grown the same year, Norchief was grown as a seedling in the field in 1961, when the initial selection was made.

The tubers of Norchief are deep to bright red in color, smooth and shallow eyes. The appearance is much like Norland but the skin color is much darker red.

Norchief is higher in yield than Norland but quite comparable to other late maturing varieties like Red Pontiac and LaRouge (Table 4). Norchief is much like Norland in that it produces a high percentage of U. S. No. 1 potatoes.

The total solids of this new variety are much

Table 2. U. S. No. 1 Yield of Norchip and Three Standard White Chipping Varieties Grown at Grand Forks and Park River, 1965-1967.

Variety	1965		1966		1967		average	
	GF cwt/A	PR cwt/A	GF cwt/A	PR cwt/A	GF cwt/A	PR cwt/A	GF cwt/A	PR cwt/A
Norchip	226	241	175	272	144	99	182	204
Kennebec	253	251	184	234	160	133	199	206
Irish Cobbler	194	191	212	257	123	116	176	188
La Chipper	136	192	159	202	145	116	147	170

Table 3. Per Cent Total Solids of Norchip and Three Standard White Chipping Varieties Grown at Grand Forks and Park River, 1965-1967.

Variety	1965		1966		1967		average	
	GF %	PR %	GF %	PR %	GF %	PR %	GF %	PR %
Norchip	22.2	22.7	20.3	22.4	24.6	22.4	22.4	22.5
Kennebec	20.3	22.0	19.4	20.9	23.7	19.9	21.1	20.9
Irish Cobbler	22.2	22.7	20.1	22.0	23.3	23.3	21.9	22.7
La Chipper	21.6	22.0	19.4	21.2	24.0	21.8	21.7	21.7

Table 4. U. S. No. 1 Yield of Norchief and Three Standard Red Varieties Grown at Grand Forks and Park River, North Dakota, 1965-1967.

Variety	1965		1966		1967		average	
	GF cwt/A	PR cwt/A	GF cwt/A	PR cwt/A	GF cwt/A	PR cwt/A	GF cwt/A	PR cwt/A
Norchief	224	231	163	266	151	127	179	208
Red Pontiac	219	270	222	258	172	137	204	222
Norland	130	166	142	264	115	122	129	184
La Rouge	215	230	132	246	135	149	161	208

Table 5. Per Cent Total Solids of Norchief and Three Standard Varieties Grown at Grand Forks and Park River, North Dakota, 1965-1967.

Variety	1965		1966		1967		average	
	GF %	PR %	GF %	PR %	GF %	PR %	GF %	PR %
Norchief	21.2	20.9	19.0	21.8	23.3	21.6	21.2	21.4
Red Pontiac	19.9	19.9	18.0	20.3	21.4	19.0	19.8	19.7
Norland	18.6	20.3	18.6	20.3	21.4	21.4	19.5	20.7
La Rouge	20.9	21.4	18.4	20.3	23.1	21.8	20.8	21.2

higher than of any of the common red varieties grown in the Midwest. Tests for three years at two locations showed the total solids of Norchief to be above 21 per cent. (Table 5).

The low total solids of many of our common red varieties has been a disadvantage for the consumer and processor and the introduction of Norchief should add a higher quality red potato to the market. However, caution should be made not to over cook Norchief or any other high total solids variety, as they have a tendency to boil to pieces.

Norchief was tested in the North Central Regional Potato trials during 1965-67. Overall merit ratings for three years placed Norchief first during 1965 and 1967 and second to the check variety Norland in 1966. Norchief rated very high in Indiana, Ohio, Iowa, Minnesota, North Dakota, Missouri, and Wisconsin.

Norchief is medium late in maturing. It has a slightly upright plant, which should be highly advantageous for cultivating and spraying. Plant vigor is similar to Red Pontiac.

Although Norchief has no important disease resistance, it does seem quite tolerant to russet and common scab. Norchief is susceptible to late blight and to most common potato viruses.

Insect Preference Studies

Concurrent with the cultural and processing studies in Norchip and Norchief, insect preference studies were conducted to assess the magnitude of insect infestations and define the factors influencing the populations of the potato insect complex in Norchip and Norchief and other selections and varieties.

While populations of potato-infesting insects in the Red River Valley are generally found in low to moderate numbers, annual occurrence of any of the principal species varies markedly from year to year. Principal species encountered include the potato flea beetle, *Epitrix cucumeris*, potato leafhopper, *Empoasca fabae*, six-spotted leafhopper,

Macrosteles fascifrons, and the green peach aphid, *Myzus persicae*.

In 1965 studies were initiated to ascertain feeding preference by these species on certain numbered selections and varieties of potatoes. Included among these was Norchip (ND5899-1) and Norchief (ND5778-2R). Samples from populations of the above-listed insects were taken at regular intervals at two locations in the Red River Valley throughout 1965, 1966 and 1967. The most definitive responses were determined for the flea beetle, as aphid populations were almost non-existent and leafhopper populations markedly depressed during the three years this study was in progress.

During the three years of this study, populations of *Myzus persicae*, the green peach aphid, were too low to obtain any data of consequence. Greenhouse studies suggest this species will colonize and reproduce without hindrance on Norchip.

Data (Table 6) summarize results obtained from flea beetle samples. Varieties exhibiting negative values are those exhibiting degrees of field tolerance to feeding of this species. If it is assumed that the total numbers of flea beetles collected at each sampling period are representative of the total population, it is possible to calculate the mean number of beetles and the deviations (+ and -) from the mean for the variety at each sampling. The total of these deviations over all sampling periods can be used as an index to indicate the degree of field tolerance or susceptibility when compared to some other commercial varieties that are cultivated in this area. While no true resistance to *E. cucumeris* was found, both Norchip and Norchief exhibited field tolerance to this species. When compared to Norland and Snowflake, both highly susceptible varieties, this degree of tolerance is appreciable.

In Tables 7 and 8 data are depicted which reflect the response of Norchip, Norchief and other varieties to the leafhopper species. While populations were too low during the course of this study

Table 6. Relative indication of Field Tolerance of Potato Selections to Potato Flea beetle, *E. CUCUMERIS*, as indicated by Totals of Deviations From the Mean. Grand Forks and Voss, North Dakota. 1965-1967.

Variety	1965	Grand Forks 1966	1967 ¹	Totals			(3 yrs. both Locations)
				1965	Voss 1966	1967	
Bounty	-307	-117	—	+18	-542	—	
LaRouge	-240	+36	-297	-444	+71	-219	-1093
Viking	-201	-116	-188	-418	-341	+81	-1183
Norchip	-74	-51	+3	-704	-606	-320	-1734
Norchief	-15	-158	+189	-972	-808	-165	-2307
Norgold Russet	+41	+42	-69	-433	-590	-318	-1244
Snowflake	+271	+89	+16	+1659	+523	+864	+3422
Norland	+339	+201	+166		+978	+146	+1830

¹All plots inadvertently planted on alkali land. Growth markedly affected.

²Data improperly recorded.

Table 7. Total Numbers of Six Spotted Leafhopper, MAC-ROSTELIS FASCIFRONS, Recorded on Potato Varieties. Grand Forks and Voss, North Dakota, 1965-1967.

Variety	Grand Forks				Voss		
	1965	1966	1967	Total	1965	1966	1967 Total
Bounty	121	38	—	158	125	101	—
LaRouge	97	43	18	158	57	115	47
Viking	119	82	19	220	75	132	83
Norchip	81	63	37	181	75	103	41
Norchief	59	67	27	153	64	72	72
Norgold							
Russet	128	90	22	240	122	150	63
Snowflake	69	46	22	137	71	84	72
Norland	72	60	28	160	21	129	48

Table 8. Total Numbers of Potato Leafhopper, EMPOASCA FABAE, Recorded on Potato Varieties. Grand Forks and Voss, North Dakota. 1965-1967.

Variety	Grand Forks				Voss		
	1965	1966	1967	Total	1965	1966	1967 Total
Bounty	105	99	—	204	121	187	—
LaRouge	95	114	8	217	51	182	7
Viking	77	68	12	157	72	151	19
Norchip	60	71	7	138	70	109	17
Norchief	71	76	10	157	55	179	23
Norgold							
Russet	82	92	15	189	88	152	11
Snowflake	59	63	11	133	91	124	20
Norland	47	58	9	114	37	210	9

to define the results, the data collected suggest no appreciable tolerance is exhibited to these two insect species.

Since these data were collected under Red River Valley conditions, it is not known whether this apparent high tolerance to flea beetles will occur when these varieties are grown in other areas of the country where insect numbers may constitute a more severe problem.

Studies are in progress to define the factors contributing to flea beetle tolerance and susceptibility.

New Grain Storage Plans Available

A centralized farm grain handling and storage system is becoming increasingly important. New plans are available to assist with grain bin location, arrangement and equipment selection. The plans show how to arrange grain bins as they are added so equipment and facilities can be added in an orderly manner. Over the years, then, a mechanized system can result which will store 20,000 to 40,000 bushels. A set of these new plans is available for review at county agent offices. Individual copies can be ordered from the Extension Agricultural Engineer, North Dakota State University, Fargo. Ask for plan MW 73292 or MW 73293, "Grain-Feed Handling Center." Cost for each plan is two dollars. The plans, produced by the Midwest Plan Service, represent the efforts of agricultural engineers in 12 North Central states.

Effect of Stand on Yield and Nitrogen Content of Corn In Southeastern North Dakota

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dence of barren plants at certain stand levels in 1964 as compared to 1965 may have contributed to the higher NO₃ content in the corn forage at maturity. The amount of experimental variation in the NO₃ values was probably associated with the difficulty in obtaining representative forage samples as a result of the heterogeneous distribution of NO₃ within an individual plant. The chemical analyses show that a bushel of shelled corn contained between 0.90 and 0.98, and 1.06 and 1.12 pounds of N in 1965 and 1964, respectively.

Summary

The effect of five stand levels (6,000, 10,000, 14,000, 18,000, and 22,000 plants per acre) on grain yields, forage production, and uptake of nitrogen was investigated in four trials conducted in Richland County on fine textured soils during the years 1963 through 1965. The desired stand for maximum grain production differed in the various trials and appeared to be influenced by the available soil moisture. Forage production throughout the growing season tended to be greatest at the highest plant stands. The percentage of nitrogen and nitrate-N in the corn forage decreased during the growing season. Negligible amounts of nitrate accumulated in the corn grain. A lower amount of nitrate-N was present in corn forage obtained from the 6,000-plant stand.

